

Pipeline and Hazardous Materials Safety Admin., DOT

§ 173.435

Where:

n + m represents all the radionuclides in the mixture;

m are the radionuclides that do not need to be considered;

$a_{(i)}$  is the activity of radionuclide i in the mixture; and

$A_{(i)}$  is the  $A_1$  or  $A_2$  value, as appropriate for radionuclide i.

(h) Tables 7 and 8 are as follows:

TABLE 7—GENERAL VALUES FOR  $A_1$  AND  $A_2$

| Radioactive contents  | $A_1$              |                      | $A_2$              |                      |
|---|--------------------|----------------------|--------------------|----------------------|
|   | (TBq)              | (Ci)                 | (TBq)              | (Ci)                 |
| 1. Only beta or gamma emitting nuclides are known to be present ..... | $1 \times 10^{-1}$ | $2.7 \times 10^0$    | $2 \times 10^{-2}$ | $5.4 \times 10^{-1}$ |
| 2. Only alpha emitting nuclides are known to be present ....          | $2 \times 10^{-1}$ | $5.4 \times 10^0$    | $9 \times 10^{-5}$ | $2.4 \times 10^{-3}$ |
| 3. No relevant data are available .....                               | $1 \times 10^{-3}$ | $2.7 \times 10^{-2}$ | $9 \times 10^{-5}$ | $2.4 \times 10^{-3}$ |

TABLE 8—GENERAL EXEMPTION VALUES

| Radioactive contents  | Activity concentration for exempt material |                       | Activity limits for exempt consignments |                      |
|---|--|-----------------------|---|----------------------|
|   | (Bq/g)                                     | (Ci/g)                | (Bq)                                    | (Ci)                 |
| 1. Only beta or gamma emitting nuclides are known to be present ..... | $1 \times 10^1$                            | $2.7 \times 10^{-10}$ | $1 \times 10^4$                         | $2.7 \times 10^{-7}$ |
| 2. Only alpha emitting nuclides are known to be present ....          | $1 \times 10^{-1}$                         | $2.7 \times 10^{-12}$ | $1 \times 10^3$                         | $2.7 \times 10^{-8}$ |
| 3. No relevant data are available .....                               | $1 \times 10^{-1}$                         | $2.7 \times 10^{-12}$ | $1 \times 10^3$                         | $2.7 \times 10^{-8}$ |

[69 FR 3677, Jan. 26, 2004; 69 FR 55119, Sept. 13, 2004]

§ 173.434 Activity-mass relationships for uranium and natural thorium.

The table of activity-mass relationships for uranium and natural thorium are as follows:

| Thorium and uranium enrichment <sup>1</sup> (Wt% <sup>235</sup> U present) | Specific activity    |                   |                      |                   |
|--|----------------------|-------------------|----------------------|-------------------|
|  | TBq/gram             | Grams/Tbq         | Ci/gram              | Grams/Ci          |
| 0.45 (depleted) .....  | $1.9 \times 10^{-8}$ | $5.4 \times 10^7$ | $5.0 \times 10^{-7}$ | $2.0 \times 10^6$ |
| 0.72 (natural) .....   | $2.6 \times 10^{-8}$ | $3.8 \times 10^7$ | $7.1 \times 10^{-7}$ | $1.4 \times 10^6$ |
| 1.0 .....  | $2.8 \times 10^{-8}$ | $3.6 \times 10^7$ | $7.6 \times 10^{-7}$ | $1.3 \times 10^6$ |
| 1.5 .....  | $3.7 \times 10^{-8}$ | $2.7 \times 10^7$ | $1.0 \times 10^{-6}$ | $1.0 \times 10^6$ |
| 5.0 .....  | $1.0 \times 10^{-7}$ | $1.0 \times 10^7$ | $2.7 \times 10^{-6}$ | $3.7 \times 10^5$ |
| 10.0 .....   | $1.8 \times 10^{-7}$ | $5.6 \times 10^6$ | $4.8 \times 10^{-6}$ | $2.1 \times 10^5$ |
| 20.0 .....   | $3.7 \times 10^{-7}$ | $2.7 \times 10^6$ | $1.0 \times 10^{-5}$ | $1.0 \times 10^5$ |
| 35.0 .....   | $7.4 \times 10^{-7}$ | $1.4 \times 10^6$ | $2.0 \times 10^{-5}$ | $5.0 \times 10^4$ |
| 50.0 .....   | $9.3 \times 10^{-7}$ | $1.1 \times 10^6$ | $2.5 \times 10^{-5}$ | $4.0 \times 10^4$ |
| 90.0 .....   | $2.1 \times 10^{-6}$ | $4.7 \times 10^5$ | $5.8 \times 10^{-5}$ | $1.7 \times 10^4$ |
| 93.0 .....   | $2.6 \times 10^{-6}$ | $3.9 \times 10^5$ | $7.0 \times 10^{-5}$ | $1.4 \times 10^4$ |
| 95.0 .....   | $3.4 \times 10^{-6}$ | $3.0 \times 10^5$ | $9.1 \times 10^{-5}$ | $1.1 \times 10^4$ |
| Natural thorium .....  | $8.1 \times 10^{-9}$ | $1.2 \times 10^8$ | $2.2 \times 10^{-7}$ | $4.6 \times 10^6$ |

<sup>1</sup> The figures for uranium include representative values for the activity of uranium-234 which is concentrated during the enrichment process. The activity for thorium includes the equilibrium concentration of thorium-228.

[Amdt. 173-244, 60 FR 50307, Sept. 28, 1995, as amended by 63 FR 52849, Oct. 1, 1998]

§ 173.435 Table of  $A_1$  and  $A_2$  values for radionuclides.

The table of  $A_1$  and  $A_2$  values for radionuclides is as follows:

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq)          | $A_1$ (Ci) <sup>b</sup> | $A_2$ (TBq)          | $A_2$ (Ci) <sup>b</sup> | Specific activity    |                      |
|------------------------|---------------------------|----------------------|-------------------------|----------------------|-------------------------|----------------------|----------------------|
|                        |                           |                      |                         |                      |                         | (TBq/g)              | (Ci/g)               |
| Ac-225 (a) .....       | Actinium (89) .....       | $8.0 \times 10^{-1}$ | $2.2 \times 10^1$       | $6.0 \times 10^{-3}$ | $1.6 \times 10^{-1}$    | $2.1 \times 10^3$    | $5.8 \times 10^4$    |
| Ac-227 (a) .....       | .....                     | $9.0 \times 10^{-1}$ | $2.4 \times 10^1$       | $9.0 \times 10^{-5}$ | $2.4 \times 10^{-3}$    | 2.7                  | $7.2 \times 10^1$    |
| Ac-228 .....           | .....                     | $6.0 \times 10^{-1}$ | $1.6 \times 10^1$       | $5.0 \times 10^{-1}$ | $1.4 \times 10^1$       | $8.4 \times 10^4$    | $2.2 \times 10^6$    |
| Ag-105 .....           | Silver (47) .....         | 2.0                  | $5.4 \times 10^1$       | 2.0                  | $5.4 \times 10^1$       | $1.1 \times 10^3$    | $3.0 \times 10^4$    |
| Ag-108m (a) .....      | .....                     | $7.0 \times 10^{-1}$ | $1.9 \times 10^1$       | $7.0 \times 10^{-1}$ | $1.9 \times 10^1$       | $9.7 \times 10^{-1}$ | $2.6 \times 10^1$    |
| Ag-110m (a) .....      | .....                     | $4.0 \times 10^{-1}$ | $1.1 \times 10^1$       | $4.0 \times 10^{-1}$ | $1.1 \times 10^1$       | $1.8 \times 10^2$    | $4.7 \times 10^3$    |
| Ag-111 .....           | .....                     | 2.0                  | $5.4 \times 10^1$       | $6.0 \times 10^{-1}$ | $1.6 \times 10^1$       | $5.8 \times 10^3$    | $1.6 \times 10^5$    |
| Al-26 .....            | Aluminum (13) .....       | $1.0 \times 10^{-1}$ | 2.7                     | $1.0 \times 10^{-1}$ | 2.7                     | $7.0 \times 10^{-4}$ | $1.9 \times 10^{-2}$ |